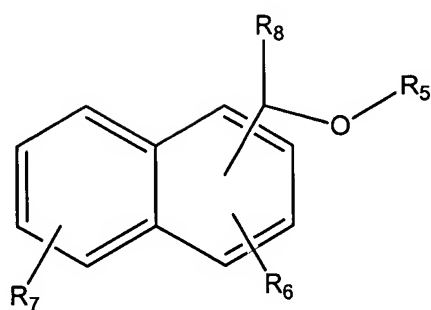
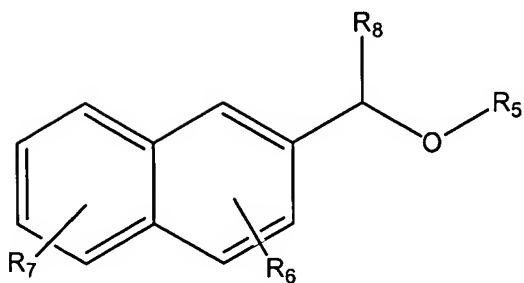
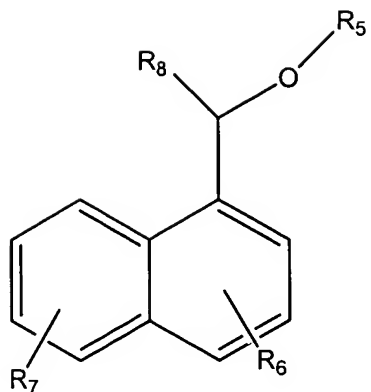


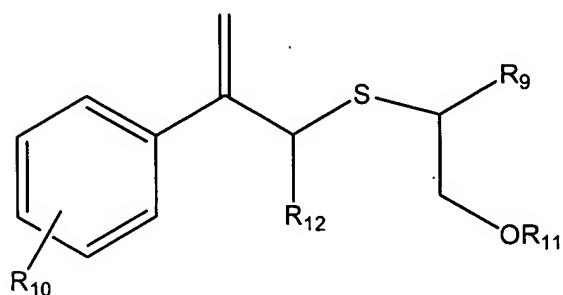
## CLAIMS

### What is claimed is:

- 5 1. A method for releasing polymers from an array of polymers on a solid substrate, said method comprising the steps of:
- providing a solid substrate;
- attaching a plurality of linkers to the substrate, each said linker comprising a cleavable moiety, wherein said cleavable moiety is activatable only at a distinct set of conditions
- 10 and wherein activation of said cleavable moiety disrupts the linker to allow release of the polymer, to provide a substrate with a plurality of attached linkers;
- attaching a first monomer to at least one of said plurality of attached linkers to provide an attached first monomer;
- attaching a second monomer to a least one of said attached first monomer or said
- 15 plurality of attached linkers to provide an attached second monomer;
- attaching a third monomer to a least one of said attached first monomer, said second monomer or said plurality of attached linkers to provide an attached third monomer;
- repeating said steps of attaching monomers until the desired array of polymers is complete;
- 20 and subjecting the array to the distinct set of conditions to release polymers from said array.
2. The method of claim 1 wherein said monomers are nucleotides.
3. The method of claim 1 wherein said cleavable moiety comprises a photogroup.
4. The method of claim 3 wherein said photogroup is selected from the group
- 25 consisting of

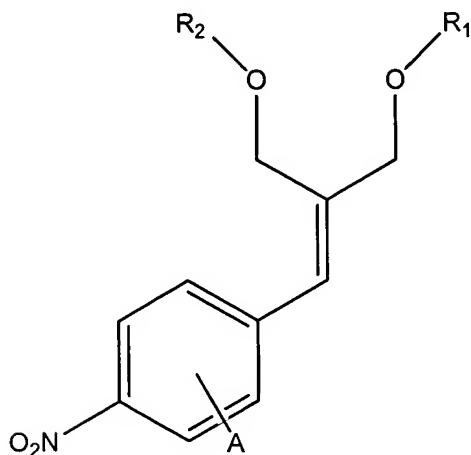


and



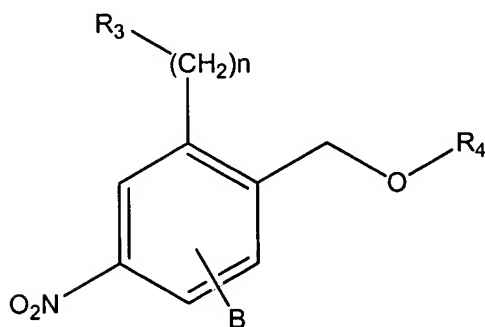
wherein  $R_5$  and  $R_{11}$  are, independently, a DMT group (4,4'dimethoxytrityl), a carbonate,  
5 or a phosphate,  $R_8$ ,  $R_9$  and  $R_{12}$  are, independently H, alkyl, alkenyl, or substituted aryl,  
and  $R_6$ ,  $R_7$ , and  $R_{10}$  are, independently, H, or a substituted alkoxy, alkyl, alkenyl, aryl,  
amine or carboxylic acid.

2. The method of claim 3 wherein said photogroup is activated by light having a wavelength of 313 nm and below.
3. The method of claim 3 wherein said photogroup is activated by light having a wavelength of about 313 nm and below, but not above 313 nm.
- 5 6. The method of claim 1 wherein said monomers are amino acids.
7. The method of claim 1 wherein said cleavable moiety is selected from the group consisting of



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wherein  $\text{R}_1$  is a DMT group or a photolabile protecting group, a carbonate or a phosphate,  $\text{R}_2$  is H, a carbonate, phosphate or a thiol,  $\text{A}$  is H, a substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid and



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wherein  $\text{R}_4$  is a DMT group, a carbonate, or a phosphate;  $\text{R}_3$  is H, a carbonate, a phosphate or a thiol, and  $n$  is whole number between 0 and 6,  $\text{B}$  is H, substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid

and wherein said set of conditions comprises a mild aqueous solution .

8. A method for releasing polymers from an array of polymers on a solid substrate, said method comprising the steps of:

providing a solid substrate;

5 attaching a plurality of linkers to said solid substrate, said solid substrate having a surface, each said linker comprising a cleavable moiety, wherein said cleavable moiety is activatable only at a distinct set of conditions and wherein activation of said cleavable moiety disrupts the linker to allow release of the polymer from the array, to provide a plurality of attached linkers and wherein each said linker has two terminal ends, the first  
10 end of which is attached to the substrate and the second end of which is away from the substrate and comprises a reactive group covered by a photoprotective removable group having a first activation energy wavelength;

selectively exposing said photoprotective removable group on said attached linkers to light to selectively remove said photoprotective groups and provide unprotected reactive  
15 groups in one or more predefined regions;

exposing under reactive conditions said one or more predefined regions with exposed reactive groups to a first monomer and attaching said first monomer to the exposed reactive groups, wherein said first monomer comprises a reactive group protected by a photoprotective removable group having said first activation energy wavelength;

20 selectively exposing said photoprotective removable groups on said attached linkers or said attached first monomer to light to selectively remove said photoprotective groups and expose reactive groups in one or more predefined regions;

exposing under reactive conditions said one or more predefined regions with exposed reactive groups to a second monomer and attaching said second monomer to said exposed  
25 groups, wherein said second monomer comprises a reactive group protected by a photoprotective removable group having a first activation energy wavelength;

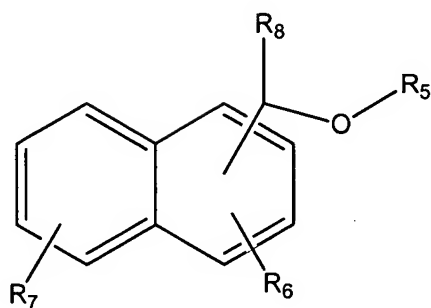
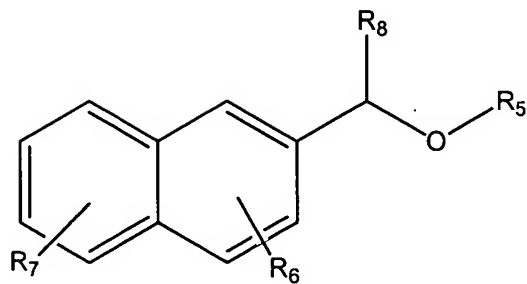
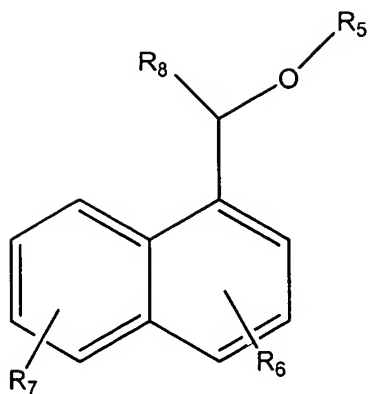
repeating said steps of selectively exposing photoprotective removable groups and exposing reactive groups to further monomers each comprising a reactive group protected

by a photoprotective removable group until the desired array of polymers is complete and subjecting the array to the distinct set of conditions to release the array of polymers.

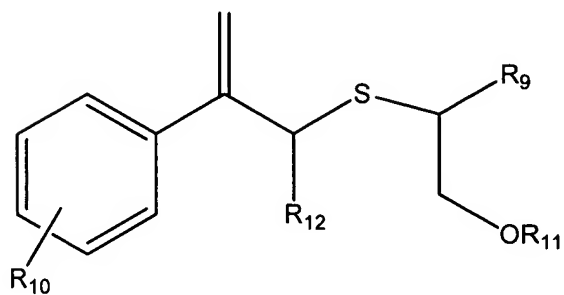
9. A method for releasing polymers from an array of polymers on a solid substrate according to claim 8 wherein said monomer is a nucleotide.

5 10. A method for releasing polymers from an array of polymers on a solid substrate according to claim 8 wherein said cleavable moiety comprises a photogroup having a second wavelength of activation energy, wherein said first wavelength of activation energy is different than said second wavelength of activation energy and where said cleavable moiety comprising a photogroup is not released by exposure to said first  
10 wavelength of light.

11. A method for releasing polymers from an array of polymers on a solid substrate according to claim 10 wherein said photogroup is selected from the group consisting of



and

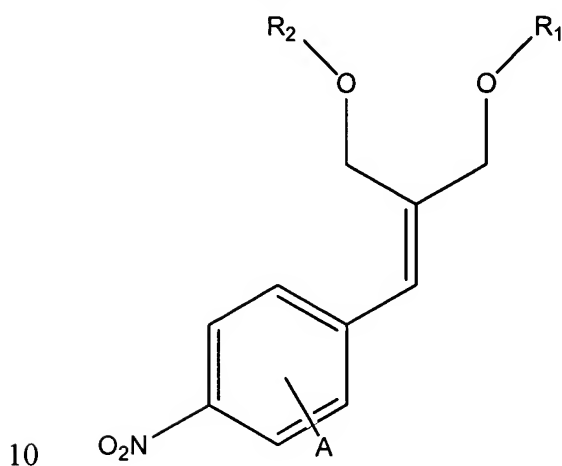


wherein  $R_5$  and  $R_{11}$  are, independently, a DMT group (4,4'dimethoxytrityl), a carbonate,  
or a phosphate,  $R_8$ ,  $R_9$  and  $R_{12}$  are, independently H, alkyl, alkenyl, or substituted aryl,  
5 and  $R_6$ ,  $R_7$ , and  $R_{10}$  are, independently, H, or a substituted alkoxy, alkyl, alkenyl, aryl,  
amine or carboxylic acid.

12. A method for releasing polymers from an array of polymers on a solid substrate according to claim 10 wherein said second energy of activation wavelength is about 313 nm and below.

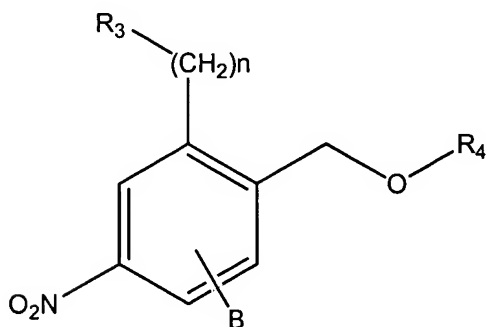
5 13. A method for releasing polymers from an array of polymers on a solid substrate according to claim 8 wherein said monomer is an amino acid.

14. A method for releasing polymers from an array of polymers on a solid substrate according to claim 8 wherein said cleavable moiety comprises a compound selected from the group consisting of



wherein  $\text{R}_1$  is a DMT group, a photolabile protective group, a carbonate or a phosphate,  $\text{R}_2$  is H, a carbonate, phosphate or a thiol, A is H, a substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid and

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wherein  $\text{R}_4$  is a DMT group, a photolabile protecting group, a carbonate, or a phosphate;  $\text{R}_3$  is H, a carbonate, a phosphate or a thiol, and n is whole number between 0 and 6, B is H, substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid

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and wherein said set of conditions comprises a mild aqueous solution .

15. A releasable polymer array comprising a substrate having a linker comprising a  
5 cleavable moiety which is labile under a set of conditions and attached to said linker is a  
polymer, wherein said polymer can be released by exposure of the array to the set of  
conditions.

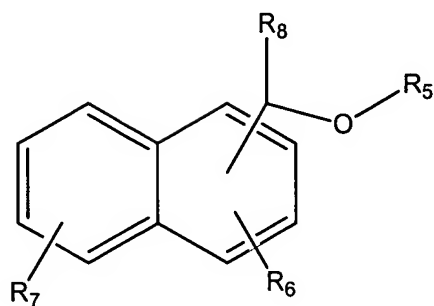
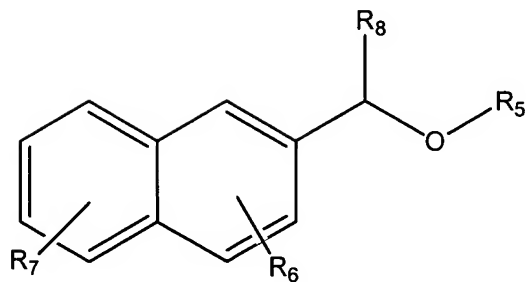
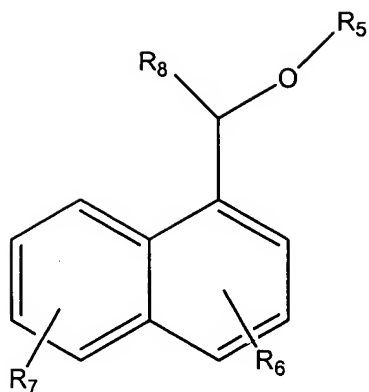
16. A releasable polymer array according to claim 15 wherein said polymer is a  
nucleic acid.

10 17. A releasable polymer array according to claim 16 wherein said nucleic acid is an  
oligonucleotide.

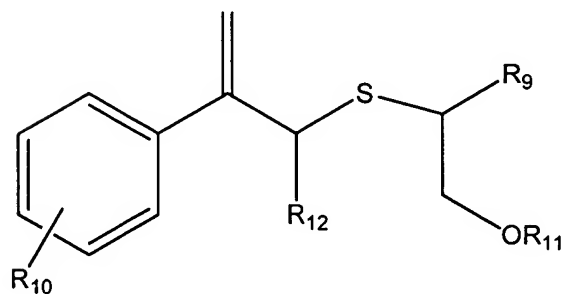
18. A releasable polymer array according to claim 15 wherein said cleavable moiety  
comprises a photogroup.

15 19. A releasable polymer array according to claim 18 wherein said photogroup is  
selected from the group consisting of





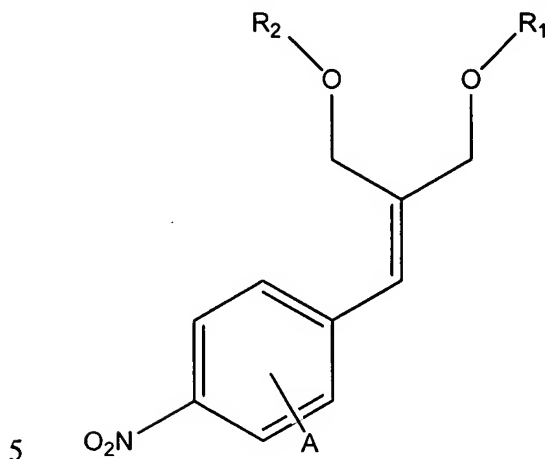
and



- wherein  $R_5$  and  $R_{11}$  are, independently, a DMT group (4,4'dimethoxytrityl), a carbonate,  
5 or a phosphate,  $R_8$ ,  $R_9$  and  $R_{12}$  are, independently H, alkyl, alkenyl, or substituted aryl,  
and  $R_6$ ,  $R_7$ , and  $R_{10}$  are, independently, H, or a substituted alkoxy, alkyl, alkenyl, aryl,  
amine or carboxylic acid.

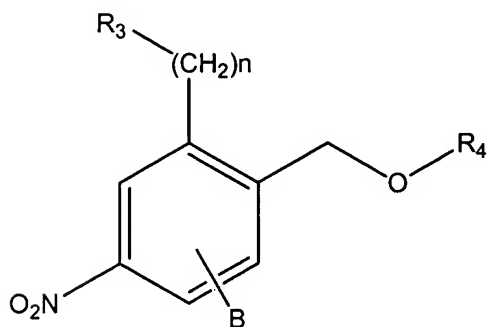
20. A releasable polymer array according to claim 18 wherein said polymer is a peptide.

21. A releasable polymer arrays according to claim 18 wherein said cleavable moiety comprises a compound selected from the group consisting of



wherein R1 is a DMT group, a photolabile protective group, a carbonate or a phosphate, R2 is H, a carbonate, phosphate or a thiol, A is H, a substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid and

10



wherein R4 is a DMT group, a photolabile protecting group, a carbonate, or a phosphate; R3 is H, a carbonate, a phosphate or a thiol, and n is whole number between 0 and 6, B is

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H, substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid

and wherein said set of conditions comprises a mild aqueous solution .

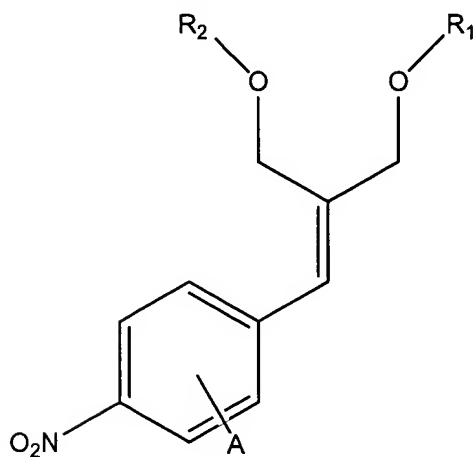
22. A polymer array having releasable polymers, said array comprising a substrate having attached thereto polymers, wherein one or more of said polymers comprises a

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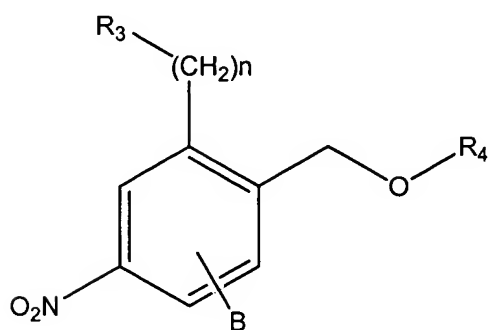
cleavable moiety which is labile under a distinct set of conditions wherein said releasable group allows release of the polymer upon activation.

23. A nucleic acid array according to claim 22 wherein said cleavable moiety comprises a photogroup which may be activated by light having a wavelength of 313 nm and below.

24. A nucleic acid array according to claim 22 wherein said cleavable moiety is photogroup comprises a compound selected from the group consisting of



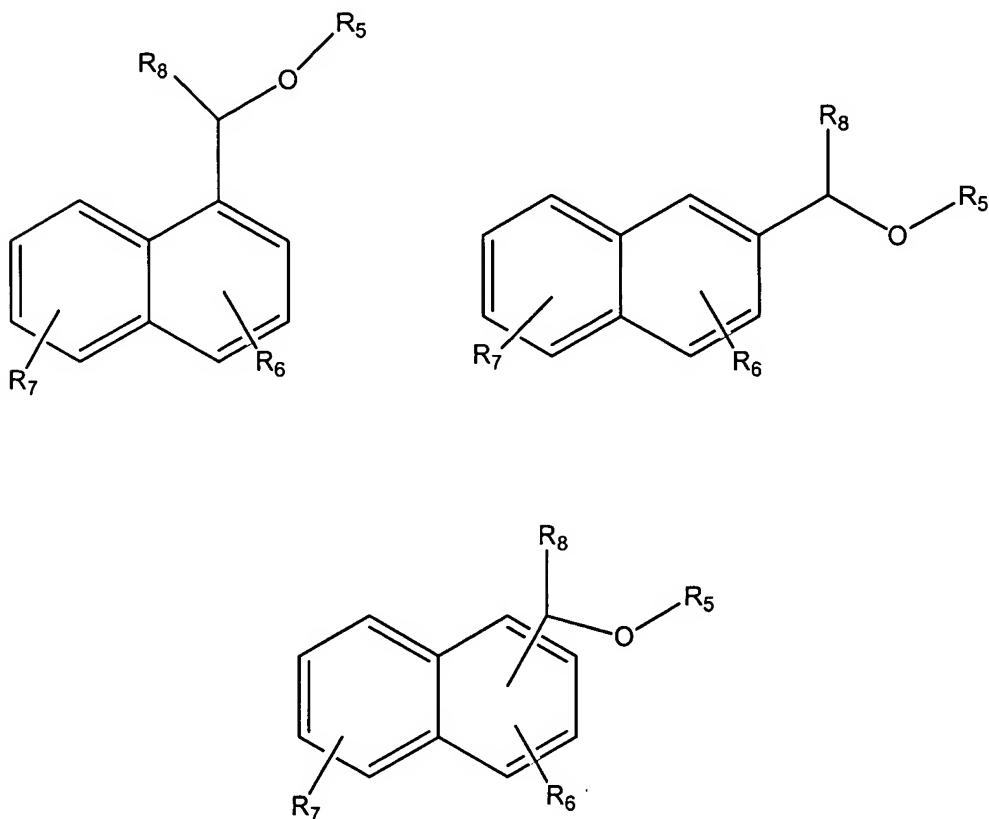
wherein R<sub>1</sub> is a DMT group, a photolabile protective group, a carbonate or a phosphate, R<sub>2</sub> is H, a carbonate, phosphate or a thiol, A is H, a substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid and



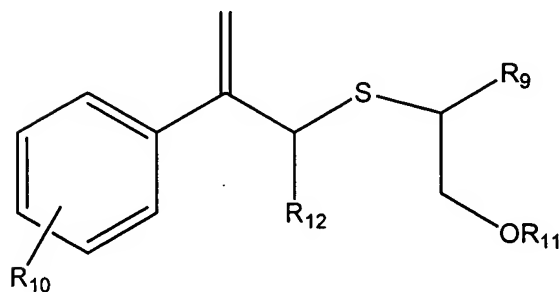
wherein R<sub>4</sub> is a DMT group, a photolabile protecting group, a carbonate, or a phosphate; R<sub>3</sub> is H, a carbonate, a phosphate or a thiol, and n is whole number between 0 and 6, B is H, substituted alkoxy, alkyl, alkenyl, substituted aryl, amine or carboxylic acid

and wherein said set of conditions comprises a mild aqueous solution.

25. A nucleic acid array according to claim 22 wherein said cleavable moiety is a photogroup comprises a compound selected from the group consisting of



and



5

wherein  $R_5$  and  $R_{11}$  are, independently, a DMT group (4,4'dimethoxytrityl), a carbonate, or a phosphate,  $R_8$ ,  $R_9$  and  $R_{12}$  are, independently H, alkyl, alkenyl, or substituted aryl,

and R<sub>6</sub>, R<sub>7</sub>, and R<sub>10</sub> are, independently, H, or a substituted alkoxy, alkyl, alkenyl, aryl, amine or carboxylic acid.

26. A polymer array having releasable polymers according to claim 22 wherein said  
5 polymers are nucleic acids.

27. A polymer array having releasable polymers according to claim 26 wherein said nucleic acids are oligonucleotides.

10 28. A polymer array having releasable polymers according to claim 22 wherein said polymers are selected from the group consisting of proteins and peptides.

29. A method for fabricating a polymer array having releasable polymers, said method comprising the steps of:

15 providing a substrate;

attaching a plurality of linkers to said substrate, said linkers comprising a cleavable moiety which is labile under a distinct set of conditions;

20 reversibly modifying said cleavable moiety with a protecting group to provide a reversibly modified cleavable moiety wherein said modified cleavable moiety is not labile under the distinct set of conditions;

attaching a first monomer to said linker;

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attaching a second monomer to said linker or to the first monomer;

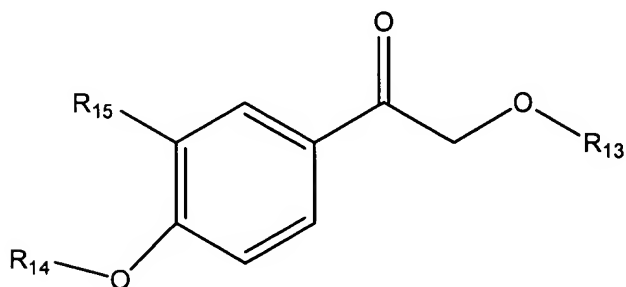
repeating said step of attaching said further monomer until the desired array of polymers is complete; and

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demodifying said reversibly modified releasable group.

30. A method for fabricating a polymer array according to claim 29 wherein said cleavable moiety comprises a photogroup.

31. A method for fabricating a polymer array according to claim 30 wherein said  
5 protecting group is



wherein R<sub>13</sub> a DMT group (4,4'dimethoxytrityl), a carbonate, or a phosphate, R<sub>14</sub> is a  
substituted silyl group and R<sub>15</sub> is H, or a substituted alkoxy, alkyl, alkenyl, aryl, amine or  
10 carboxylic acid.